Bariatric Surgery for Overweight Adolescents? Concerns and Recommendations

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Abstract

As the prevalence of obesity and obesity-related disease among adolescents in the US continues to escalate, physicians are increasingly faced with the dilemma of deciding the best treatment strategies for affected patients. This report offers an approach to evaluate an adolescent’s candidacy for bariatric surgery. In addition to anthropometrics and co-morbidity assessment, a number of unique factors must be critically assessed in overweight youth. In an effort to reduce the risk of adverse medical and psychosocial outcomes following bariatric surgery and increase compliance and follow up, principles of adolescent growth and development, decision capacity of the patient, family structure, and barriers to adherence must be considered. Consideration for bariatric surgery is generally warranted only when adolescents have failed at least 6 months of organized weight loss attempts and have met certain anthropometric, medical, and psychological criteria. We suggest that candidates should be very severely obese (BMI $\geq 40$), have attained a majority of skeletal maturity (generally girls $\geq 13$ and boys $\geq 15$ years of age), and have comorbidities related to obesity which might be remedied by durable weight loss. Potential candidates for bariatric surgery should be referred to centers with multidisciplinary weight management teams with expertise in meeting the unique needs of overweight adolescents. Surgery should be performed in institutions which are equipped to meet tertiary care needs of severely obese patients.

Introduction

Over the past 30 years, the prevalence of overweight among pediatric age groups in the United States has almost tripled. Currently, conservative estimates show that
15.5% of children and adolescents are obese (BMI >95th percentile for age) (1). The health consequences of this epidemic are enormous, and the burden on our healthcare system is rapidly increasing. Annual hospital costs for obesity related diagnoses in the pediatric population increased threefold increase between 1979-1981 and 1997-1999 (2); separately, for adults the economic burden of obesity on the healthcare system in 2002 has been estimated at $93 billion (3).

Studies show that 50% to 77% of children and adolescents who are obese carry their obesity into adulthood, thus increasing the potential of developing serious and often life-threatening conditions. This risk increases to 80% if just one parent is also obese (4-8). Conditions frequently associated with severe obesity include premature mortality, coronary heart disease, obstructive sleep apnea, hypertension, dyslipidemia, and type 2 diabetes mellitus (4, 9-13), which has significant and well documented cardiac, renal and ophthalmic complications for young adults (14). Other serious conditions include pseudotumor cerebri, steatohepatitis, slipped capital femoral epiphysis, Blount’s disease, cholelithiasis, polycystic ovary syndrome, and early severe degenerative joint disease (15, 16). Also noteworthy, reported quality of life scores of obese children are significantly lower than those of children with normal weight (17).

Excessive weight gain is influenced by genetic, environmental and biological factors (18, 19). Reversing the current trend will require a multifaceted approach and coordinated research efforts aimed at identifying optimal treatment strategies. Until such progress is made, physicians will increasingly be confronted with a rising number of young patients in whom the consequences of obesity take a serious toll. For adolescents
who have failed organized attempts to lose weight and/or maintain weight loss through conventional nonoperative approaches and who have serious or life-threatening conditions, bariatric surgery may provide the only viable alternative for achieving a healthy weight and for escaping the devastating physical and psychological effects of obesity.

As the need for a surgical weight loss option for younger patients becomes evident, physicians are faced with the task of delineating clear, realistic, and restrictive guidelines for using this aggressive approach. Due to the recognized long term deleterious effects of obesity, bariatric surgery is commonly performed for adults with a BMI $\geq 35$ with comorbidities or for adults with a BMI $\geq 40$ with or without comorbidities, as suggested by 1991 NIH consensus conference guidelines (20). Simply adopting these guidelines for use in younger age groups would overlook the unique metabolic, developmental, and psychological needs of adolescents and could result in the inappropriate use and/or overuse of weight loss surgery in adolescents. More conservative patient selection criteria should be considered in adolescents also because: although many comorbidities of obesity can be documented in childhood and adolescence, the severity of these complications in the majority of obese (BMI $\geq 30$) adolescents does not warrant surgical intervention in a minor, who by legal statute cannot give his or her own consent for the procedure; behavioral therapy approaches to weight management have been shown to be more effective in children and adolescents compared to adults (21); a proportion (20-30%) of obese adolescents may not be destined to become obese adults (5); finally, there are few data in adults and no data in adolescents suggesting that surgical weight loss improves the early mortality suffered by those with
severe obesity. For these reasons, in general, surgery should be reserved for very severely obese adolescents with comorbidities, and only after careful deliberation (22).

In light of these considerations, a group of surgeons and pediatricians specializing in the treatment of overweight and obese children recently met to consider relevant concerns (names and affiliations are listed in the appendix). This paper represents the consensus reached by participants at this meeting, based on their current knowledge and clinical practice. The key issues to be discussed include patient evaluation and selection, surgical management and long-term follow-up.

**Patient Evaluation**

Body mass index (BMI, weight in kg/[height in meters, squared]) is a useful screening tool for assessing and tracking the degree of obesity in adolescents (23, 24). The medical evaluation should include investigation into possible endogenous causes for obesity that may be amenable to treatment, as well as identification of any obesity-related health complications. Likely candidates for bariatric surgery should be referred to centers with multidisciplinary weight management teams experienced in meeting the distinct physical and psychological needs of adolescents. These teams should include specialists with expertise in adolescent obesity evaluation and management, psychology, nutrition, physical activity instruction, and bariatric surgery. Depending on individual needs, additional expertise in adolescent medicine, endocrinology, pulmonology, gastroenterology, cardiology, orthopaedics, and ethics should be readily available. The team approach should include a review process (patient review board) similar to that used in multidisciplinary oncology and transplant programs. This review should result in
specific treatment recommendations for individual patients, including appropriateness and timing of possible operative intervention.

In addition to undergoing medical assessment, potential candidates should undergo a comprehensive psychological evaluation involving both patient and parent interviews to assist in assessing the family unit, determining the coping skills of the adolescent and assessing the severity of psychosocial comorbidities. This evaluation may inform the team of family strengths or family dysfunction that could have a significant impact on the overall success of bariatric surgery because of the influence of the family environment on postoperative regimen adherence.

The presence of certain circumstances or medical conditions should alert clinicians to the fact that bariatric surgery is not a realistic treatment option. These include: a medically correctable cause of obesity; a substance abuse problem within the preceding year; a medical, psychiatric, or cognitive condition which would significantly impair the patient’s ability to adhere to postoperative dietary or medication regimens; current lactation, pregnancy, or planned pregnancy within two years of surgery; inability or unwillingness of either patient or parent to fully comprehend the surgical procedure and its medical consequences, and the need for lifelong medical surveillance.

**Patient Selection**

In the absence of strong clinical evidence supporting the long term efficacy and safety of bariatric surgery in adolescents, patient selection for operative management requires consideration of a number of factors (Table 1) and careful clinical judgment by
the multidisciplinary bariatric team. Certain comorbid conditions of obesity can be considered serious, progressive, and may respond well to surgical weight loss. In patients with very severe obesity (BMI ≥ 40), the presence of a severe comorbid condition (Table 2) should prompt early referral for consideration for bariatric surgery. Consideration for bariatric surgery should also be given to adolescents with a higher BMI (perhaps ≥ 50) with less serious obesity-related comorbid conditions (Table 2), if the conditions can be predictably corrected with surgical weight loss, and if the short- and long-term risks of not operating are thought to be greater than those associated with operation. It is important to recognize that no clinical algorithm can be rigidly applied to all patients; some conditions in the “less serious” category may, in individual patients, be quite severe and compelling indications for bariatric surgical intervention even though the BMI is not ≥ 50. The clinical judgment of the bariatric team should determine the appropriateness of surgical intervention for individual patients. The adolescent patient must also be highly motivated and capable of understanding the lifestyle changes that are necessary, as well as the risks, side effects, and lifelong need for medical surveillance.

Surgical Management

Determining optimal timing. The timing for surgical treatment of clinically severe obesity in adolescents is controversial, and often depends upon the severity of obesity related comorbidities of individual patients. Neuroendocrine, skeletal, and psychosocial maturation are accelerated during adolescence, and it is not yet known how these processes are affected by restrictive or malabsorptive surgical procedures. The rapid somatic growth seen in early adolescence requires adequate nutrition; hence bariatric
procedures performed prior to the growth spurt could conceivably compromise linear growth. Importantly, overweight children (especially girls) experience early onset of puberty, and they are likely to achieve skeletal maturity (adult stature) earlier in adolescence than age-matched non-overweight children. When there is uncertainty about whether adult stature has been attained, this can be objectively assessed by bone age from a radiograph of the hand and wrist. If an individual has attained $\geq 95\%$ of adult stature by this examination, there is little concern that a bariatric procedure would significantly impair completion of linear growth. However, it is unknown whether or to what extent bariatric surgery may adversely affect bone mineral density and increase the risk of brittle fractures later in life. Finally, while many severely obese adolescents may be deemed physiologically mature, few may be psychologically ready for a bariatric surgical intervention.

**Informed permission.** Assent for surgery must be obtained from the adolescent patient, while informed permission must be obtained from the responsible parent(s) or guardian(s) prior to operation. Both patients and parents must also be made aware of the fact that bariatric surgery is a procedure with considerable risks, including the risk of death. Although bariatric procedures can result in substantial weight loss, the long-term metabolic, nutritional, and psychological effects in adolescents are unknown. Likewise, they must understand that the durability of surgically induced weight loss in adolescents remains to be clearly defined.

**Preoperative education.** An important element of long-term health and weight loss success is the development of an integrated multidisciplinary education program. Such a program must be aimed at teaching both parents and patients about the anatomic and
physiologic feature of the proposed surgery, the lifelong need for strict adherence to nutritional guidelines and daily physical activity, and offering behavioral strategies to meet these demands. Attendance at adolescent bariatric support group meetings before and after operation can also be quite helpful.

**Laboratory and radiologic investigations.** Several studies should be performed when considering a patient for bariatric surgery. These studies may exclude conditions which may contraindicate bariatric surgery, or identify the presence of obesity related comorbid conditions. These studies include: chest radiograph, abdominal sonogram (to rule out gallstones), electrocardiogram, comprehensive chemistry profile (including liver function tests), lipid profile, complete blood count, glucose tolerance test, hemoglobin A1C, fasting blood glucose and fasting insulin levels, thyroid function test, pregnancy test for females, and screening for micronutrient deficiencies. For patients with symptoms of obstructive sleep apnea, a polysomnogram is suggested. Finally, bone age assessment should be considered for younger patients to document the degree of skeletal maturity.

**Choice of operative procedure.** There is currently a paucity of data comparing the efficacy and safety of various bariatric procedures in adolescents. However, both Roux-en-Y gastric bypass (25-33) (Figure 1) and adjustable gastric banding (AGB; Figure 2) (34) have been effective in treating the medical consequences of severe obesity in adolescence.

The literature pertaining to adult bariatric surgery indicates both advantages and disadvantages of these procedures. The advantages of gastric bypass seen in adults include excellent excess weight loss ([EWL] 60%-80% at 1 year); sustainable weight loss (50% EWL maintained for up to 14 years); inherent deterrence to carbohydrate ingestion;
and enhanced satiety following the surgery. Early risks associated with gastric bypass include pulmonary embolism, wound infection, stomal stenoses, and marginal ulcers. Significantly, there is a greater risk of perioperative death with gastric bypass (0.5%) compared with AGB (0.05%)(35). Potential late complications of bypass include small bowel obstruction, incisional hernia, symptomatic cholelithiasis, protein calorie malnutrition, and micronutrient deficiencies, especially of iron, calcium, and vitamin B₁₂.

Though data for adolescents are limited, a study of 33 adolescents ranging in age from 12 to 18 years reported an EWL of 56% in 14 patients who were ≥10 years following gastric bypass surgery (27). After 14 years, however, only 6 patients were available for interview (of 9 eligible), and they maintained only 33% EWL. Thus, late weight regain is a definite concern in adolescents, perhaps even more so than in adults. There have been four late deaths reported in adolescents between 15 months and 6 years postoperatively; these were thought to be unrelated to the surgical procedure (25, 27).

The AGB consists of a laparoscopically placed silicone band that encircles the proximal most stomach, just beyond the gastroesophageal junction. The band is adjustable by injection of saline into a peripherally placed reservoir. The band is removable if necessary, and in most cases, should have no significant adverse effect on esophagogastric anatomy. Thus, major advantages of the use of AGB include the ease and safety of minimally invasive placement, adjustability, and reduced potential for adverse nutritional consequences.

There are a number of potential disadvantages of the device. The AGB has not been approved by the FDA for use in patients <18 years of age, and there are few insurance plans that currently provide coverage for this procedure. Some earlier US
studies highlighted surgical complications and lesser degrees of weight loss of AGB compared to gastric bypass (36-40), although more favorable data are now being seen in US centers (41). In the most experienced centers of Europe and Australia, where outcomes have been very good, patients have been followed for less than a decade, thus long-term results of the procedure are not known (42-44). Possible device-related complications include port malposition or malfunction, tubing leaks, band slippage leading to gastric prolapse, and foreign body infection, and band erosion into the stomach or esophagus. Moreover, since these mechanical devices have a finite lifetime, adolescent patients may need to undergo replacement(s) of the device during their lifetime. Although nutritional risks are distinctly less than those seen with gastric bypass, it has been argued that the AGB is similar to the vertical banded gastroplasty and therefore may not be the best option for sweet eaters (45). Others, however, have shown that sweet eaters and non sweet eater do similarly well after AGB (46). For all of these reasons, an appropriately designed trial to determine whether gastric bypass or AGB is the preferred technique for adolescents is needed.

**Postoperative Concerns.** There are numerous postoperative concerns. To avoid nutritional complications of bariatric surgery, patients must adhere to guidelines for diet and vitamin/mineral supplementation. Gastric bypass essentially results in surgically enforced very low-calorie, low-carbohydrate dietary intake (especially after gastric bypass), thus requiring attention to an adequate (50-70 grams) daily intake of protein. Multivitamins, iron, calcium, vitamin B₁₂, and (for menstruating females) iron needs to be supplemented after gastric bypass. A bariatric dietitian who is familiar with the
progressive addition of food items with more complex composition and consistency can be helpful with meal planning and nutritional “troubleshooting” as recovery proceeds.

Although pregnancies can be safely supported after bariatric surgery, reliable contraception should be used for at least the first year following the operation due to the increased risk to the fetus posed by the period of rapid weight loss. Iron deficiency anemia due to menstrual bleeding can also be minimized with oral contraception. After the rapid weight loss period, pregnancies should be carefully planned and monitored.

**Long-term Follow-up**

Meticulous, lifelong medical supervision of adolescent patients who undergo bariatric procedures is essential. During the first postoperative year, regular visits to the surgeon, and other subspecialists with expertise in nutrition and obesity management, psychologist, dietitian, and exercise physiologist should be provided to identify potential complications, and to reinforce compliance with required eating behaviors, medications and nutritional supplements, and physical activity regimens. Early hematological or metabolic complications can be detected by periodic assessment of blood count, blood chemistry profile, and body composition. Psychosocial adjustments during the postoperative period of rapid weight loss may present new, unanticipated hurdles for the adolescent. The multidisciplinary team approach should minimize the adverse impact of these hurdles as a healthier weight is achieved.

It is strongly recommended that patients who have undergone bariatric surgery should be monitored throughout their lives, to ensure optimal postoperative weight loss and overall good health. Ongoing data collection should be maintained in order to determine optimal treatment strategies.
Summary and Recommendations

1. Operative management may be warranted for very severely obese adolescents who have serious obesity-related comorbid conditions and who have failed organized attempts to achieve sustained weight loss

2. Suggested criteria for operative intervention (Tables 1 and 2) cannot be applied rigidly to every patient but should be tailored to the individual patient’s needs based on their maturity level and severity of comorbid conditions

3. A multidisciplinary team with expertise in adolescent weight management and bariatric surgery should carefully consider the indications, contraindications, risks, and benefits of bariatric surgery for individual patients

4. It is essential for patients and their families to realize that bariatric surgery is not a “cure” for obesity, but rather an effective weight loss tool when patients are compliant with recommended dietary and physical activity regimens

5. Patients and families must fully understand the known risks and possible side effects of individual bariatric surgical procedures and participate in decision making
6. Bariatric surgery should be performed in a setting that can afford patients access to tertiary care capable of managing surgical patients with complications of severe obesity
Table 1: Adolescents being considered for bariatric surgery should:

- Have failed at least 6 months of organized attempts at weight management and;
- Have attained or, depending on the severity of co-morbidity, nearly attained physiologic maturity and;
- Be very severely obese (BMI \( \geq 40 \)) with serious obesity related co-morbidities or have a BMI \( \geq 50 \) with less severe comorbidities and;
- Demonstrate commitment to comprehensive medical and psychological evaluation both before and after surgery and agree to avoid pregnancy for at least one year postoperatively, and;
- Be capable of and willing to adhere to nutritional guidelines postoperatively, and;
- Provide informed assent to surgical management.

Table 2: Obesity-related conditions that may be improved with bariatric surgery:

Serious comorbidities

- Type 2 diabetes mellitus
- Obstructive sleep apnea
- Pseudotumor cerebri
Less serious comorbidities

- Hypertension
- Dyslipidemias
- Non alcoholic steatohepatitis
- Venous stasis disease
- Significant impairment in activities of daily living
- Intertriginous soft tissue infections
- Stress urinary incontinence
- Gastroesophageal reflux disease
- Weight-related arthropathies which impair physical activity
- Obesity-related psychosocial distress

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Figure 1: Roux en Y gastric bypass for clinically severe obesity
Figure 2: Adjustable gastric band
References


